Amendments in the claims:

1. (currently amended) A pulse-by-pulse optical absorption apparatus, comprising:
(a) a cavity;
(b) a light source for delivering a pulse into said cavity;
(c) a time resolving means for optically time resolving at least one response pulse produced by said cavity in response to said pulse; and
(d) a detector for detecting an intensity of ~~said at least one response~~ at least one time-resolved pulse produced by said time resolving means.

2. (original) The pulse-by-pulse optical absorption apparatus of claim 1, wherein said light source is an ultra fast light source and said pulse is an ultra short pulse.

3. (original) The pulse-by-pulse optical absorption apparatus of claim 1, wherein said at least one response pulse is at least one ultra short response pulse and said time resolving means is an ultra fast time resolving means.

4. (original) The pulse-by-pulse optical absorption apparatus of claim 3, wherein said ultra fast time resolving means further comprises a nonlinear medium for mixing said at least one ultra short response pulse with a resolving pulse.

5. (original) The pulse-by-pulse optical absorption apparatus of claim 4, wherein said resolving pulse is a chirped pulse.

6. (original) The pulse-by-pulse optical absorption apparatus of claim 1, wherein said at least one response pulse is at least one ultra short response pulse and said detector is an ultra fast detector.

7. (original) The pulse-by-pulse optical absorption apparatus of claim 1, wherein said at least one response pulse comprises a train of response pulses.

8. (original) The pulse-by-pulse optical absorption apparatus of claim 7, wherein said detector further comprises a comparing device for comparing at least two said response pulses from said train of response pulses.

9. (original) The pulse-by-pulse optical absorption apparatus of claim 1, wherein said cavity is a linear cavity with a predetermined cavity length set to resolve said at least one response pulse at said detector.

10. (original) The pulse-by-pulse optical absorption apparatus of claim 9, wherein said cavity length is on the order of micrometers to set a time regime of said at least one response pulse on the order of femtoseconds.

11. (original) The pulse-by-pulse optical absorption apparatus of claim 9, wherein said cavity length is on the order of millimeters to set a time regime of said at least one response pulse on the order of picoseconds.

12. (original) The pulse-by-pulse optical absorption apparatus of claim 9, wherein said cavity length is on the

order of meters to set a time regime of said at least one response pulse on the order of nanoseconds.

13. (original) The pulse-by-pulse optical absorption apparatus of claim 9, wherein said cavity comprises at least one low reflector.

14. (original) The pulse-by-pulse optical absorption apparatus of claim 1, wherein said cavity is a non-linear cavity with a predetermined cavity length set to resolve said at least one response pulse at said detector.

15. (original) The pulse-by-pulse optical absorption apparatus of claim 14, wherein said cavity length is on the order of micrometers to set a time regime of said at least one response pulse on the order of femtoseconds.

16. (original) The pulse-by-pulse optical absorption apparatus of claim 14, wherein said cavity length is on the order of millimeters to set a time regime of said at least one response pulse on the order of picoseconds.

17. (original) The pulse-by-pulse optical absorption apparatus of claim 14, wherein said cavity length is on the order of meters to set a time regime of said at least one response pulse on the order of nanoseconds.

18. (original) The pulse-by-pulse optical absorption apparatus of claim 14, wherein said non-linear cavity comprises at least one low reflector.

19. (original) The pulse-by-pulse optical absorption apparatus of claim 1, wherein said cavity comprises an absorption sample whose absorption properties change in time.

20. (currently amended) A method for pulse-by-pulse optical absorption measurement, comprising the steps of:

(a) providing a cavity;

(b) delivering a pulse into said cavity;

(c) optically time resolving at least one response pulse produced by said cavity in response to said pulse; and

(d) detecting an intensity of ~~said~~ at least one time-resolved response pulse.

21. (original) The method of claim 20, wherein said step of delivering a pulse, comprises the step of:

providing a means for delivering an ultra short pulse into said cavity.

22. (original) The method of claim 21, wherein said step of time resolving said at least one response pulse, comprises the step of:

time resolving at least one ultra short response pulse produced by said cavity in response to said ultra short pulse.

23. (original) The method of claim 22, wherein said step of detecting said at least one response pulse comprises the step of:

detecting said at least one ultra-short response pulse.

24. (original) The method of claim 22, wherein said step of time resolving at least one response pulse comprises the step of:
providing a nonlinear medium for mixing said at least one ultra short response pulse with a resolving pulse.

25. (original) The method of claim 24, wherein said resolving pulse is a chirped pulse.

26. (original) The method of claim 20, wherein said at least one response pulse is a train of response pulses.

27. (original) The method of claim 26, wherein step of detecting further comprises the step of comparing at least two response pulses from said train of response pulses.

28. (original) The method of claim 20, wherein said step of detecting further comprising the step of:
providing an extracting means for analyzing said at least one response pulse.

29. (original) The method of claim 20, wherein said step of providing a cavity, comprises the step of:
providing a linear cavity with a predetermined cavity length set to resolve said at least one response pulse at said detector.

30. (original) The method of claim 29, wherein said predetermined cavity length is on the order of micrometers to set a time regime of said at least one response pulse on the order of femtoseconds.

31. (original) The method of claim 29, wherein said predetermined cavity length is on the order of millimeters to set a time regime of said at least one response pulse on the order of picoseconds.

32. (original) The method of claim 29, wherein said predetermined cavity length is on the order of meters to set a time regime of said at least one response pulse on the order of nanoseconds.

33. (original) The method of claim 29, wherein said step of providing a linear cavity,
comprises the step of:
providing at least one low reflector.

34. (original) The method of claim 20, wherein said step of providing a cavity, comprises the step of:
providing a non-linear cavity with a predetermined cavity length set to resolve said at least one response pulse at said detector.

35. (original) The method of claim 34, wherein said predetermined cavity length is on the order of micrometers to set a time regime of said at least one response pulse on the order of femtoseconds.

36. (original) The method of claim 34, wherein said predetermined cavity length is on the order of millimeters to set a time regime of said at least one response pulse on the order of picoseconds.

37. (original) The method of claim 34, wherein said predetermined cavity length is on the order of meters to set a time regime of said at least one response pulse on the order of nanoseconds.

38. (original) The method of claim 34, wherein said step of providing a linear cavity, comprises the step of:
providing at least one low reflector.

39. (original) The method of claim 20, further comprising the step of:
providing a changing absorption sample within said cavity.

DETAILED RESPONSE

rejections under 103(a)

Claims 1-7, 9-26, and 28-39 stand rejected under 103a as obvious in view of Logunov (US 6,392,753).

With respect to claim 1, it is asserted that Logunov discloses all elements of this claim, except for the claimed "time resolving means for resolving" being a time resolving means. It is further asserted that "resolving means" allegedly present in Logunov obviously "perform the same function" as the claimed means.

Claim 1 is currently amended to more particularly define the present invention. In particular, "means for resolving" is amended to "means for optically time resolving" to clarify the function performed by the claimed means. Support for this claim element, both as filed and as currently amended, is present in the specification, in connection with various discussions of "structure for time resolution" (e.g., page 3 lines 28-30, page 6 lines 6-8, and page 7 lines 10 through page 8 line 4). In addition, claim 1 is amended to recite detection of "at least one time-resolved pulse", which is supported in the specification on page 6, line 16.

Applicants believe claim 1 as currently amended is not rendered obvious by Logunov because Logunov does not teach or suggest "means for optically time resolving".

In the Office Action, Examiner draws attention to (and refers to) element 37 (fig 5A) in Logunov as a "resolving means". Element 37 in Logunov is "an optical sample disposed external to the optical cavity" according to the disclosure of Logunov (col 8 lines 6-7). This identification of element 37 as a "resolving means" is apparently based on teachings in Logunov that relate cavity ring-down time to absorption in a sample disposed within a cavity (col 5 lines 27-35).

Applicants respectfully disagree with three aspects of Examiner's reasoning as applied to claim 1.

1) Element 37 on Figure 5a is positioned outside of the optical cavity. The fact that the ring-down time of an optical cavity containing element 37 would depend on the absorption coefficient of element 37 is irrelevant to consideration of functions performed by element 37 disposed outside the optical cavity.

2) The dependence of ring-down time on sample properties is not a function of "optically time resolving", or "time resolving", or even "resolving". As made clear throughout the specification (e.g., page 6 lines 11-14) "resolving" entails isolation of a single pulse, typically from within a pulse train. The dependence of cavity ring-down time on sample absorption has nothing at all to do with the time variation of the optical source illuminating the cavity. For example, the cavity ring-down time is the same for CW cavity illumination as it is for pulsed cavity illumination, all other parameters being equal.

3) The "means for" language in claim 1 does not appear to have been construed properly. The present office action relies on an allegation that it is obvious the reference structure performs the same function as the recited function. However, the claim limitation: "a time resolving means for optically time resolving at least one response pulse produced by said cavity in response to said pulse" does not read on all structures performing the function of "optically time resolving at least one response pulse produced by said cavity in response to said pulse". Instead, in accordance with 35 USC 112 sixth paragraph, the quoted claim limitation reads on structures performing the quoted function that are disclosed in the specification, and equivalents thereof. Such structure is disclosed in connection with various discussions of "structure for time resolution" (e.g., page 3 lines 28-30, page 6 lines 6-8, and page 7 lines 10 through page 8 line 4) in the specification.

Since the analysis in the office action does not appear to even consider the structure disclosed corresponding to the "means for" claim element, Applicants contend that a prima facie case for obviousness has not been made in the Office Action.

With respect to claim 20, Examiner's rejection of claim 20 is based on the same reasoning as used in the rejection of claim 1.

Claim 20 is currently amended to more particularly define the present invention. In particular, the step of "time resolving" is amended to "optically time resolving", and

detection of "at least one time-resolved pulse" is recited. These changes are supported in the specification as indicated above for claim 1.

Applicants believe claim 20 as currently amended is not rendered obvious by Logunov because Logunov does not teach or suggest "optically time resolving".

In the Office Action, Examiner draws attention to (and refers to) element 37 (fig 5A) in Logunov as a "resolving means". Element 37 in Logunov is "an optical sample disposed external to the optical cavity" according to the disclosure of Logunov (col 8 lines 6-7). This identification of element 37 as a "resolving means" is apparently based on teachings in Logunov that relate cavity ring-down time to absorption in a sample disposed within a cavity (col 5 lines 27-35).

Applicants respectfully disagree with two aspects of Examiner's reasoning as applied to claim 20.

1) Element 37 on Figure 5a is positioned outside of the optical cavity. The fact that the ring-down time of an optical cavity containing element 37 would depend on the absorption coefficient of element 37 is irrelevant to consideration of functions performed by element 37 disposed outside the optical cavity.

2) The dependence of ring-down time on sample properties is not a function of "optically time resolving", or "time resolving", or even "resolving". As made clear throughout the specification (e.g., page 6 lines 11-14) "resolving"

entails isolation of a single pulse from within a pulse train. The dependence of cavity ring-down time on sample absorption has nothing at all to do with the time variation of the optical source illuminating the cavity. For example, the cavity ring-down time is the same for CW cavity illumination as it is for pulsed cavity illumination, all other parameters being equal.

Although Applicant's response to the rejections of independent claims 1 and 20 is believed sufficient to address rejections of claims 2-7 and 9-19 dependent on claim 1, and claims 21-26, and 28-39 dependent on claim 20, the following brief comments are made with respect to some of the rejected dependent claims:

With respect to claims 2, 3, 6, and 21-23 there is no motivation in Logunov for ultra-short optical pulses. Logunov teaches a method for optical damage testing, and the relevant parameters are number of pulses and pulse energy density (e.g, as given in example of col 1 lines 44-46). Logunov has no teachings regarding pulse duration. Since various pulse durations for various purposes are known in the art, there is no general presupposition in the art that "shorter pulses are better" that can be combined with Logunov's silence on this point.

With respect to claims 4-5, and 24-25, provision of a nonlinear medium for mixing a response pulse with a resolving pulse is in no way taught or suggested by Logunov.

allowable subject matter

Claims 8 and 27 stand as allowable, if rewritten in independent form to remove dependence on a rejected claim.

Applicants acknowledges the indication of allowable subject matter in claims 8 and 27.